A-53
Multilayer Monochromators for 5 keV to 20 keV Photon Energy Range

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Seven multilayer structures were deposited on flat silicon substrates by using conventional magnetron sputtering technique [1]. Parameters of the structures are the following:

Ru/B_4C, d = 2.83 nm, N = 170, gamma = 0.41

Ni/B_4C, d = 4.52 nm, N = 100, gamma = 0.47

SiC/B_4C, d = 5.3 nm, N = 300, gamma = 0.3

V/B_4C, d = 3.02 nm, N = 300, gamma = 0.26

V/B_4C, d = 2.3 nm, N = 500, gamma = 0.28

T/B_4C, d = 4.01 nm, N = 250, gamma = 0.3

W/B_4C, d = 1.5 nm, N = 300, gamma = 0.3

The multilayers were tested at the Swiss Light Source Optics beamline (X05DA). It is a bending magnet beamline working in the range between 5.5–22.5 keV, with a flux of >1 x 10^{11} ph/sec (@ 10 keV/400 mA) [2]. Silicon photodiode (AXUV100) with a quadratic area of 1 cm^2 was used as a detector. A double-slit system with slit size of 0.5 x 0.5 mm was installed between the samples and the vacuum pipe. Software automatically set the energy and the corresponding Bragg angle by using multilayers d-spacing values as one of input parameters. Scan tool adjusted the Bragg angle to the given energy and made rocking curve scans around the Bragg peak.

Peak reflectivity and resolution of the multilayer structures were measured. A good correspondence was found between calculated and experimental data.

1. Y. Platonov et al., *Proc. of SPIE*, **3152**, 231 (1997).
2. U. Flechsig, A. Jaggi, S. Spielmann, H. A. Padmore, and A. A. MacDowell, *Nuclear Instruments and Methods in Physics Research A*, **A609**, 281–285 (2009).